Department of Health and Environmental Sciences
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Ladies and Gentlemen:

The attached impact statement is submitted for your consideration. Comments should be sent to me by January 5, 1974.

Sincerely,

Daniel W. Vichorek

Daniel Vichorek
Technical Writer

DV:dg

FORWARD

This ~~draft~~ Final environmental impact statement is submitted pursuant to the Montana Environmental Policy Act, (MEPA) Section 69-6504 (b)(3). The statement was prepared by the Environmental Sciences Division of the Montana State Department of Health and Environmental Sciences, regarding a proposed hydrometallurgical operation using the Arbiter reduction process, which would be built near Anaconda. The Anaconda Company has applied to the Air Quality Bureau for a permit to build the portion of the plant that might be capable of emitting air contaminants.

To date, research by this department has indicated that operation of the proposed plant would not result in illegal air pollution. .

Because the Air Quality Bureau would be the first agency to issue a permit for the new operation, it was designated as the lead agency under MEPA and was responsible for preparation of this statement.

Although MEPA requires the lead agency to consider all significant impacts that could result from the approval of this plant, the permit already requested by the Anaconda Company could only be denied if it appeared that illegal air pollution would occur as a result of approval.

The Montana Water Pollution Control Act requires issuance of a permit before a discharge is made to any surface water stream, but no discharge is expected for at least two years. Therefore, no discharge permit will be required in the near future. No discharge may occur within 180 days following application for the discharge permit.

Agencies and individuals with information or comments regarding impacts of any type that could result from this plant should notify the Air Quality Bureau.

## SUMMARY OF FINAL IMPACT STATEMENT FOR THE ARBITER HYDROMETALLURGICAL PLANT

Up to 560 tons daily of copper flotation concentrate would be processed at moderate temperatures and pressures to produce up to 100 tons of copper metal per day. The slurry containing the concentrate would arrive by rail.

Between 3.75 and 5 million gallons per day of water would be used for cooling with another one million gallons for tailings slurry makeup. The water would come from Warm Springs Creek, but there would be no net increase in water use, as the water used for cooling would be about the same amount as is currently used for irrigation in the disposal ponds. The cooling water will be used for irrigation after discharge from the Arbiter Plant.

The tailings slurry will be discharged to lined tailings ponds designed to settle the tailings out of the slurry. When most of the tailings are settled out, the remainder will be pumped to the existing tailings ponds 1 and 2 of the smelter operation. These ponds will contain all of the decant for at least two years with no discharge. During the two year interim, the Anaconda Company will study the best way to handle whatever overflow will come from these ponds if they fill.

There will be no significant air pollution from the plant. Operation of this plant will allow the Anaconda Company to increase its copper production by up to 100 tons per day with no significant increase in air pollution.

The plant will draw up to 20 mw of electricity. Up to 210 tons per day of limestone from the Anaconda quarry will be consumed. The environmental impacts of this plant will be small. If the operation is successful, it could lead to the eventual replacement of polluting copper smelters.

Since there is no apparent danger that air pollution standards will be violated, the state probably will move to issue the requested permit after the 30-day waiting period following publication of this statement.

The potential for water pollution will be evaluated later, and if it becomes necessary to discharge tailings water from the tailings ponds, an environmental impact statement will be prepared, if warranted. Calculations indicate such discharge would not occur for at least two years, and possibly never.

# I. DESCRIPTION OF PROPOSED OPERATION

## Plant and Process

Information submitted by the Anaconda Company indicates the proposed Arbiter plant would process up to 560 tons of copper flotation concentrate produced at Butte to yield as much as 100 tons daily of copper metal.

The copper concentrate contains 26% copper and 32% sulfur and is primarily a chalcocite ($Cu_2S$) with varying quantities of other copper, zinc and arsenic containing minerals. Large quantities of pyrite also are present.

The concentrate would come to the new plant as a slurry through a pipeline which would originate at an existing rail car unloading and pumping facility near the present pyrometallurgical smelter, which is about a mile from the site of the proposed Arbiter plant. The incoming slurry is approximately 60 to 70 percent solids. No additional water would be added to the slurry after its arrival at the unloading point.

Upon its arrival at the Arbiter site, the slurry would be stored in a 24-hour holding tank. It would then be diluted with a recycled process liquor and leached in agitated pressure vessels in the presence of gaseous oxygen and ammonia. In the Arbiter process, the copper sulfide minerals are broken down and the copper is solubilized as a copper amine sulfate. Pyrite is not affected. The reaction is carried out at moderate temperatures and pressures and the leach reactors must be cooled to maintain optimum conditions. There are three parallel trains of leach reactors, each with five reactors. A small fraction of inert gases is generated in the process, and is continuously bled to the ammonia scrubbing system.

The slurry, now containing solubilized copper and the remaining solid materials, passes to a series of four counter current decantation (CCD) thickeners where makeup water and recycled liquor called raffinate, washes the copper bearing solution away from the leach residue solids. Each of the four thickeners is 85 feet in diameter and will operate with underflow solids in the range of 55 percent. The first two CCD thickeners will be covered and vented for recovery of any ammonia fumes. Pregnant copper bearing solution from the thickeners is pumped to a clarification circuit.

Underflow leach residue solids from the CCD thickeners are pumped to a flotation circuit for recovery of silver and unleached copper values.

In the flotation circuit, the residue is repulped with water, and conditioned with zanthate, lime and frother (methyl iso-butyl carbinol) to float the silver values and some undissolved copper sulfides. The flotation concentrate is thickened and pumped back to the existing Anaconda smelter operations on an intermittent basis. The tailings from the flotation circuit are combined with gypsum discharged from the ammonia recovery circuit and pumped to a contained tailings reservoir.

In the clarification circuit, the pregnant ammoniacal solution from the flotation circuit is processed through vacuum pre-coat filters to remove the remaining solids.

The filtered pregnant solution, in the next step, passes to the liquid ion exchange, or solvent extraction process. Here the solution is contacted countercurrently in two mixer-settler stages with an organic solvent, which removes the copper content from the ammoniacal solution. The solvent, which consists of 30 percent General Mills LIX 65N in a high flashpoint distillate, reduces copper content in the ammoniacal solution from 30 grams per liter (g/l) to less than ten parts per million (ppm). The copper free ammoniacal solution returns to the leach and thickener circuits and a portion discards to the ammonia recovery section to prevent buildup of sulfate levels in the solution. Through this discharge the sulfur in the original concentrate is eventually disposed of as gypsum.

The solvent solution now bearing the copper passes to three mixer-settler stages where it is contacted countercurrently with spent electrolyte, which contains approximately 25 g/l copper as sulphate and 130 g/l of free sulfuric acid. The copper is stripped from the organic solvent and enriches the electrolyte to 40 g/l of copper with 110 g/l acid remaining. This strong electrolyte is pumped to electrowinning and the solvent is recycled to pick up more copper from the ammoniacal solution.

In the electrowinning tank house 100 T/D of copper is plated out of the strong electrolyte as metallic cathode copper. The clarified electrolyte from the mixer-settler stages enters in the head tank of the first set of 80 electrowinning cells.

Overflow from this tank feeds the second set of cells. From the head tank 100 gpm flows by gravity to each cell. Cell overflows drain to collection tanks. Copper is plated out of solution and the copper content of the electrolyte is reduced from 40 g/l to 25 g/l.

Each set of 80 cells has its own rectifier unit and three circulating pumps to transfer the electrolyte from each collection tank through the head tank and back to the electrowinning cells. The spent electrolyte at 25 g.p.l. Cu returns to the LIX section where it is again used to strip copper from the organic.

Another important operation in the plant is the ammonia recovery section, which receives about 150 GPM of ammonium sulfate solutions containing a small amount of sulfamate ($NH_2SO_3$) and variable quantities of zinc resulting from the oxidation, during leaching, of a part of the zinc mineral contained in the concentrates. The important processes carried out in this section of the plant are the precipitation of $CaSO_4$ and the release of ammonia resulting from the reaction between lime and ammonium sulfate.

The solutions are mixed with milk of lime in two trains of four boil pots. The reaction produces free ammonia in solution, and large quantities of steam are required to spring it into the vapor stream. The ammonia stream mixture flows to a fractionating tower where the ammonia is concentrated for recycling to the leach vessels. The calcium sulfate slurry is diluted and cooled to enhance formation of gypsum and mixed with flotation tailings to make up the single residue discard stream from the plant.

## Auxilliary Equipment

A. The ammonia vent system

All equipment associated with strong ammoniacal solution will be covered and vented to the ammonia vent system. The entire vent system will be operated at a slight negative pressure and all vent gases will be collected and passed through a single scrubbing tower. This tower will be 4½ feet in diameter and 55 feet tall, packed with polypropylene Intalox saddles. Ammonia is removed from the vent streams

by intimate contact with fresh cold water. Design efficiency is in excess of 99.9 percent with an entering water temperature below ambient temperature.

B. The oxygen plant

Oxygen would be generated in a standard cryogenic plant design, operated, and built by the Linde Division of the Union Carbide Corporation. The plant could produce up to 115 tons per day of oxygen gas at 40 psi and 5 tons per day of liquid oxygen. The air compressor for this unit would be driven by a 3000 HP motor.

C. The boiler plant

There would be three large boilers each capable of producing up to 90,000 pounds per hour of 125 pound steam. Two smaller boilers for the hydrolysis vessel could each produce 6000 pounds per hour of dry and saturated steam at 850 psi. Two of the large and one of the small boilers would be operating at any one time, with the others for standby.

All boilers are designed for operation with natural gas, but could burn No. 2 fuel oil if necessary. The boilers and anode casting plant together would use an estimated 5 million cubic feet of gas per day.

According to the Anaconda Company, gas is used instead of coal to keep down the cost of boiler construction, transportation, storage, and to eliminate the need for handling coal and ash. The use of coal also would cause air pollution.

D. The anode casting plant

The casting plant would be designed to cast the complete inventory of 8000 lead anodes in 60 working days. Life of the anodes is expected to be two to five years, so the plant would be used infrequently.

Lead anode casting temperature would be kept at 750-800°F, to avoid emission of lead fumes. Fume produced will be collected in a felted polyester baghouse. A 70 foot stack would vent natural gas combustion products, and two roof monitors would be provided for worker comfort as required by heating and ventilating standards. The baghouse is not yet under construction.

E. Transmission facilities

The Montana Power Company expects to extend a 230 kv line from the Mill Creek Substation approximately two miles east of Anaconda to the Arbiter plant. The line would supply up to 20 mw of electricity to the Arbiter plant, besides powering other equipment unrelated to the Arbiter plant, according to the Montana Power Company. Power would be supplied by the coal fired generators at Colstrip and other generating facilities in the Northwest Power Pool.

Figures 1 and 2 offer graphic representations of the plant site and operation.

## II. WATER SUPPLY AND WASTEWATER DISPOSAL

Approximately 6 million gallons of water per day will be used at the Arbiter plant. Of this amount, 3.7 to 5 million gallons would be used for cooling and one million gallons for tailings slurry makeup. The water presently utilized at the Anaconda operation is obtained from the Warm Springs drainage, which is supplemented by water pumped from Georgetown Lake in the Flint Creek drainage. Due to elimination or reduction of Warm Springs Creek water used directly for dust control, and the reuse of acid plant cooling water, the Arbiter plant is not expected to increase the amount of water drawn from this source.

The cooling water will be distributed to the existing pond system for dust control. The existing pond system at Anaconda covers an area of about 4,200 acres. The primary use of these ponds has been tailings disposal. Over 60 percent of the area has been filled with tailings and the additional storage capacity life of the existing ponds is estimated to be in excess of 50 years. The cooling water disposal method will elimina- or reduce the present practice of using water diverted from Warm Springs Creek for dust control at the pond system. The temperature of the cooling water will be approximately 76° F. Because of the relatively large volume of the existing pond system, ambient water temperatures should prevail; and therefore, the temperature of the discharge from the pond system should not be increased by the use of the cooling water for dust control.

Since the temperature of the discharge and flow from the pond system will not be increased, the water temperature of the receiving watercourses (Silver Bow Creek and the Clark Fork River) should not be increased because of disposal of the facility's cooling water in the aforementioned fashion. This disposal method will use little or no energy. An alternative method for treatment or disposal of the facility's cooling water includes the use of cooling towers. Cooling towers would (a) have higher capital and annual costs, (b) use more energy, and (c) not be any more effective than the method of disposal that is proposed.

The tailings slurry will be discharged to lined tailings slurry ponds (slurry ponds) designed to settle the tailings out of the slurry. The slurry ponds will be cleaned periodically and the tailings placed in dry areas of the existing pond system. The Supernatant from the slurry ponds will be pumped to the existing tailings ponds 1 and 2 of the smelter operation (disposal ponds). Utilizing natural evaporation and storage capacity, the existing disposal ponds will contain all of the decant from the new slurry ponds for a period of at least two years without overflowing. See Figure 3 for a schematic diagram of the proposed wastewater disposal system.

During the period of approximately two years that will separate the date of start up of the Arbiter plant and the date at which the disposal ponds will fill with liquid and begin to discharge, the Anaconda Company will conduct an extensive program to (a) evaluate the wastewater characteristics of the discharges from the Arbiter plant, (b) evaluate the performance of effluent control facilities, and (c) evaluate alternative methods for treatment of the wastewater from the Arbiter plant. The aforementioned program will include the following major elements:

1. Characterization of the Arbiter plant wastewater discharge.
2. Study of the feasibility of reuse of the wastewater discharge.
3. Evaluation of the process variables that affect water quality in an effort to optimize process efficiency and minimize the discharge of pollutants.
4. Expansion of the present surface water monitoring program to include monitoring of the discharges to the disposal ponds and measurements of the evaporation rate of the disposal ponds.
5. Expansion of the groundwater monitoring system by installation of two wells near the proposed slurry ponds, five wells near the disposal ponds, and nine wells near the existing pond system. Permeability tests will be run on the material in the disposal ponds to determine seepage rates. See Figure 4 for the approximate locations of the proposed wells. Monitoring results will be made available to the State Department of Health and Environmental Sciences.

6. Evaluation of the technical and financial feasibility of several alternate methods of disposal of the wastewater from the Arbiter plant, including:

   a. Irrigation. The irrigation potential of the wastewater will be evaluated using greenhouse tests.

   b. Evaporation. A solutions evaporator will be evaluated using glassware tests. If the glassware tests indicate feasibility, a pilot plant will be constructed.

   c. Anaerobic denitrification. Field tests will be conducted to determine the feasibility and process efficiency of deep trench anaerobic denitrification

   d. Activated sludge. Laboratory tests will be conducted to determine the feasibility of utilizing the activated sludge process.

   e. Anaerobic digestion. Laboratory tests will be conducted to determine the feasibility of utilizing the anaerobic digestion process.

In conjunction with conducting laboratory and pilot plant studies on the feasibility of application of the above wastewater disposal alternatives, a bioassay facility will be constructed and utilized to evaluate the toxic and chronic effects on aquatic biota of application of those alternative methods of disposal shown to be technically and financially feasible. These tests would be performed according to standard practices and latest edition of "Standard Methods for Examination of Water and Wastewater" as published by the American Public Health Association.

The feasibility of providing no surface discharge through evaporation or irrigation, if wastewater concentration of pollutants are high, has been discussed several times with the Anaconda Company personnel since the department first learned of the proposed construction of the Arbiter plant. The proposed testing program should provide further information on the feasibility of these alternatives. Potential irrigation sites being considered are located to the southwest of the smelter and to the north of the smelter across Warm Springs Creek.

In addition, several alternative methods of disposal of the wastewater from the Arbiter plant, not listed above, may be studied.

The Arbiter plant will discharge approximately 620 tons of tailings per day to the slurry ponds. The composition of these tailings is estimated as follows:

| | |
|---|---|
| Gypsum ($CaSO_4 - 2H_2O$) | 316 tons per day |
| Zinc (Sulfides, hydroxides) | 4 tons per day |
| Copper (Sulfide) | 9 tons per day |
| Iron (Pyrite) | 70 tons per day |
| Sulfur (Pyrite) | 53 tons per day |
| Inerts (Anions, Quartz) | 128 tons per day |
| Lime ($Ca(OH)_2$) | 40 tons per day |
| Nitrogen | |
| TOTAL | 620 tons per day |

The supernatant from the slurry pond will contain the following estimated quantities of constituents:

| | |
|---|---|
| Nitrogen | 16,680 pounds per day |
| Sulfates | 10,000 pounds per day |
| Calcium | 8,000 pounds per day |
| Copper | 2.7 pounds per day |
| Zinc | 1.6 pounds per day |

As discussed earlier, the disposal ponds will not overflow for at least two years following commencing of operation of the Arbiter plant. This is a prototype unit and an accurate prediction cannot be made of the actual characteristics of the wastewater at this time. The proposed interim facilities should provide adequate disposal until the aforementioned studies can be completed and a long-range means of disposal of the wastewater from the Arbiter plant constructed.

Methods previously considered for treatment of the supernatant from the slurry ponds include reverse osmosis and ion exchange for removal of sulfates and nitrogenous compounds, and mechanical-biological systems and hydrolysis for removal of nitrogenous compounds. The costs for removal of sulfates from solution are very high. To treat the solution from this plant for a reduction of sulfates to approximately 100 mg/1, the estimated capital cost using reverse osmosis is \$1.8 million with an operating cost of \$1.00 per thousand gallons (\$1,000 per day). These estimates are based on 1967 dollars, but include neutralization of a mildly acidic solution and brine. Energy requirements are

not known. However, they are expected to be higher than the requirements for the proposed disposal method. Cost estimates for ion exchange are somewhat higher than for reverse osmosis. However, in all cases, considerable development work would be necessary to determine the criteria for plant design. The estimates presented above are based on the study entitled Engineering Economic Study of Mine Drainage Control Techniques by Cyrus W. Rice, 1969.

Biological treatment of solutions containing sulfates and various nitrogenous compounds using mechanical equipment such as activated sludge (as opposed to lagooning) is presently in the development stage in the industry. A mechanical-biological plant for treatment of nitrogenous solutions, assuming technical feasibility can be established, would cost in excess of an estimated $1 million, with an operating cost of over $50,000 per year. (Reference: Cost of Conventional and Advanced Treatment of Wastewater, Robert Smith, September 1968, WPCF).

A hydrolyzer pilot plant unit is now being tested to determine design parameters and applicability to the Arbiter process. If utilized, the hydrolyzer will reduce sulfamates ($SO_3NH_2$) by as much as 99.9 percent.

The following discussion does not relate directly to the operation of the proposed Arbiter plant. However, it provides an overview of several factors relating to water use, wastewater discharges, water quality and water quality standards in the vicinity of the proposed Arbiter plant.

At the present time there is an extensive water conservation program underway at the Anaconda Reduction Works. This program includes the examination of each production unit to determine feasibility of reuse and recycle water systems. A substantial reduction in fresh water use is expected once the necessary pumping equipment and piping is installed. With the increased use of recycled water, a proportionate reduction in dissolved solids should be seen in the discharge to Silver Bow Creek. Due to this conservation program, the amount of calcium, sulfate, copper, and zinc reaching Silver Bow Creek from the Butte-

Anaconda mine-mill operations should be reduced by the time the Arbiter plant commences operation. The existing pond system presently treats the wastewater from the smelter operation and from the city of Anaconda. The effluent from the existing pond system discharges to the Warm Springs ponds located across Highway #10 near Warm Springs. The Warm Springs ponds also treat the entire flow of Silver Bow Creek. Silver Bow Creek at this point contains, in part, treated wastewater from the Anaconda Company Butte operation and treated sewage from the Butte metropolitan area. Treatment improvements installed by the Anaconda Company at Butte during the past one and one-half years have enabled the company to recycle a greater amount of wastewater and to treat all wastewater discharged to Silver Bow Creek. It is the plan to abandon the Warm Springs ponds as soon as the concentrations of metals can be reduced to acceptable levels in Silver Bow Creek. Presently, there is a pick-up of metals from the creek channel and this prohibits at this time the abandonment of the ponds. A study funded by the Anaconda Company and the State Department of Health is being conducted by the Montana School of Mineral Science and Technology on this section of stream and should give information on the effects of the tailings which have been deposited in the channel over the years. The disadvantage of using the Warm Springs ponds is that the effluent metals concentration from the ponds is affected by wind action. Pond water is stored during windy periods and later released during calm periods. Extended periods of high wind (greater than one day) can lead to poor treatment results so from this standpoint, eventual abandonment of the Warm Springs ponds is desirable. The control over the Warm Springs ponds has been improved during the past year due in part to removal of high concentrations of iron from the wastewater discharged at Butte. Better control over the ponds is also expected upon completion of a telemetering system of the pond discharge which will relay turbidity and pH results to an operating control center at the smelter.

The Clark Fork River from the confluence with Warm Springs Creek to Cottonwood Creek is classified as C-$D_2$ which means the waters shall be maintained suitable for bathing,

swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply. The April 19, 1973 results from the U. S. Geological Service sampling station are shown below. Metal analysis results are not yet available for the April 19, 1973 date. However, concentrations for April 18, 1972 are shown and should be about the same or lower for this period in time.

The Clark Fork River from Cottonwood Creek to the Little Blackfoot River is classified $C\text{-}D_1$ which means the waters should be maintained suitable for bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

The classification of the Clark Fork River below Garrison is $B\text{-}D_1$ which means the waters shall be maintained suitable for drinking, culinary and food processing purposes after adequate treatment equal to coagulation, sedimentation, filtration, disinfection and any additional treatment necessary to remove naturally present impurities; bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply.

Clark Fork River near Galen on April 19, 1973

| | |
|---|---|
| Stream Flow | 99 cfs |
| Water Temperature | 7.0°C |
| pH | 8.3 |
| Dissolved Oxygen | 10.6 mg/1 |
| Biochemical Oxygen Demand | 3.5 mg/1 |
| Phosphorous (total) | 0.04 mg/1 |
| Nitrate and Nitrite total as N | 0.29 mg/1 |
| Nitrogen total as N | 0.94 mg/1 |
| Calcium | 150 mg/1 |
| Magnesium | 18 mg/1 |
| Sodium | 16 mg/1 |
| Chloride | 8.1 mg/1 |
| Fluoride | 1.3 mg/1 |
| Sulfate | 380 mg/1 |
| Coliform Bacteria | 10/100 ml. |
| Fecal Coliform | 0/100 ml. |

April 18, 1972

| | |
|---|---|
| Stream flow | 221 cfs |
| Arsenic | 0.010 mg/l (total) |
| Cadmium | 0.004 mg/l (total) |
| Copper | 0.020 mg/l (total) |
| Iron | 0.670 mg/l (total) |
| Lead | 0.012 mg/l (total) |
| Zinc | 0.230 mg/l (total) |

The principal sources of nitrogen in the Clark Fork River at this time are probably from the Butte Metro treated sewage discharge and the Anaconda Fish Hatchery.

Monitoring of the Warm Springs ponds discharge and Silver Bow Creek above Warm Springs Creek is presently performed by the Anaconda Company. Monitoring information is provided to the Department of Health on flow, pH, turbidity, suspended solids, alkalinity, calcium, magnesium, sulfates, copper, iron, zinc, lead, cadmium, arsenic and mercury. In addition, as discussed earlier, monitoring of nitrogen in various forms will be required on the disposal ponds, existing pond systems and the Warm Springs ponds discharge. The sampling for nitrogen compounds will begin before the Arbiter plant is placed into operation.

The department is presently planning to take and analyze samples monthly from the Warm Springs pond discharge and from the Clark Fork River below Warm Springs Creek and below the Little Blackfoot River. The small amount of sampling information presently available indicates that the state's water quality standards are being met by the Anaconda Company. However, there is need of more data.

## III. AIR EMISSIONS

The exact concentrations of air pollutants are difficult to predict, as the Arbiter process is new and untried except at the pilot plant stage. However, based on the operation of the company's pilot plant in Tucson, it appears the airborne emission concentrations will be insignificant.

Sulfuric acid mist generated in the electrowinning process probably would be the only emission noticeable, even within the plant. Building ventilation would be designed to dilute in-plant concentrations below one $mg/m^3$. Atmospheric concentrations would be still less, falling well within Montana's standard of 4 $\mu g/m^3$ for an annual average according to preliminary calculations. Four discharge stacks in the roof would exhaust the building ventilation to the atmosphere.

Fuel oil purchased to operate the boilers would be low enough in sulfur content to guarantee that emissions would meet state standards. Other emissions are noted in Figures 5, 6 and 7, as compared to the emissions from the existing smelter, Figure 8.

There is no $SO_2$ emission from the Arbiter process except for an insignificant amount generated by the boiler fires.

Copper concentrates known to be high in sulfur would be diverted from the existing smelter to the Arbiter plant, thus allowing Anaconda to increase its production of copper without the addition of significant $SO_2$ emissions.

## IV. TOPOGRAPHY AND SOILS

The plant is being built in a flat area about one mile north of the existing smelter and 1000 feet south of Warm Springs Creek. The land was unused before it was graded to accommodate the plant.

## V. IMPACTS

If there are any impacts on the environment, they probably would be minor. The Anaconda area already has been heavily affected by industrial activity. Visual pollution therefore probably would not be a consideration.

Air quality in Anaconda should not be significantly degraded by the Arbiter plant. Emissions from the plant into the air are not considered significant, and no state pollution standards would be approached by the plant if engineering predictions of its performance are accurate.

The chance of a decrease in water quality resulting from the plant also seems remote.

## VI. ALTERNATIVES AVAILABLE TO THIS DEPARTMENT

1. Require water treatment facilities other than the disposal method proposed. This does not seem warranted at this time.

2. Require cooling towers. The pond system would be far more than adequate to cool the water to the ambient temperature before discharge.

3. Require a scrubber on the electrowinning cells. This would be extremely expensive because all the air in the building would have to be funneled through the scrubber. It would be required, nevertheless, if acid mist standards were violated.

As none of the above requirements appears necessary to prevent violation of pollution laws, the plant appears eligible to receive the requested permit.

According to Nathaniel Arbiter, inventer of the Arbiter process, there are two options for disposing of sulfur besides the lime-boil method currently planned for the new plant at Anaconda. One process converts the waste product to ammonia and elemental sulfur.

The other method crystallizes out ammonium sulfate. This method would require less steam and no lime. There would be less investment, less energy required, and no nitrogenous waste disposal problem.

According to the Anaconda Company, some energy savings are possible with the ammonium sulfate alternate, but this method has not yet been technically developed for use in this application. Further, according to Anaconda, the ammonia and sulfur alternate has not been developed sufficiently for full scale operations.

## VII. SHORT TERM-LONG TERM COMPARISONS

Industrialized society requires huge amounts of copper. To get the required amount of the metal, serious damage is done to the environment by mines, smelters, and the various appurtenances and emissions thereof.

However, it is now widely believed that the traditional pyrometallurgical smelting operations are obsolescent and eventually will be replaced by systems far less damaging to the environment, such as the Arbiter process. Presumably, when the Arbiter process is proven commercially feasible, its low air emissions will augur a better quality of life for residents of copper smelter towns around the world.

New systems such as the Arbiter process should make it possible to reduce impacts on the environment while accelerating the production of copper for the economy.

## VIII. IRREVERSIBLE COMMITMENT OF RESOURCES

A considerable amount of water would be lost to evaporation. However, much of this would be lost through evaporation in the irrigation and dust control processes even if the plant were not built.

Accelerated production of copper presumably will require accelerated mining activity in the open pit mine at Butte, which will speed up the destruction of old Butte, with its unique cultural history and architecture.

Further, the plant would utilize approximately 20 mw of electricity, which presumably would be generated mostly by the coal-fired generators at Colstrip. Thus, there would be an irreversible loss of coal.

There is at this time no adequate prediction of the social ramifications of allocating such a large amount of electrical energy to industry. However, considering the large increase in generating capacity now being installed in the state, it would appear there should be plenty of electricity for both industrial and domestic use.

Approximately 210 short tons per day of lime would be consumed by the plant. Lime would be produced at the Anaconda Company quarry west of the smelter.

## IX. ECONOMIC BENEFITS

The payroll of workers at the new plant would add about $1 million to the local economy yearly. The workers needed to operate the plant would be as follows:

65 operators
10 laborers
15 maintenance men
10 supervisors

Hiring will be from within the Deer Lodge-Silver Bow County area, although a few supervisory positions may be filled by personnel from elsewhere.

The operation of the plant could be made more profitable if there were a market for gypsum, but at present there is no such market within economical haul distance.

Besides the 100 permanent workers, a considerable number of construction workers employed temporarily in constructing the plant would add appreciably to the local economy. Further, the enlarged payroll in the area would lead to a substantial number of secondary jobs to supply the increased demand for additional goods and services.

The increased employment resulting directly and indirectly from the plant should do much to expand and stabilize the mining industry in the Butte-Anaconda area.

## X. COMMENTS ON THE DRAFT STATEMENT

Copies of all correspondence received are attached. We have attempted in this final statement to answer all questions raised following issuance of the draft.

The following persons helped write the final statement:

Don Holtz, Chief, Air Quality Bureau
Jon Bolstad, Environmental Engineer, Air Quality Bureau
Don Willems, Chief, Water Quality Bureau
James F. Brown, Public Health Engineer, Water Qualtiy Bureau
Daniel Vichorek, Technical Writer, Environmental Sciences Division

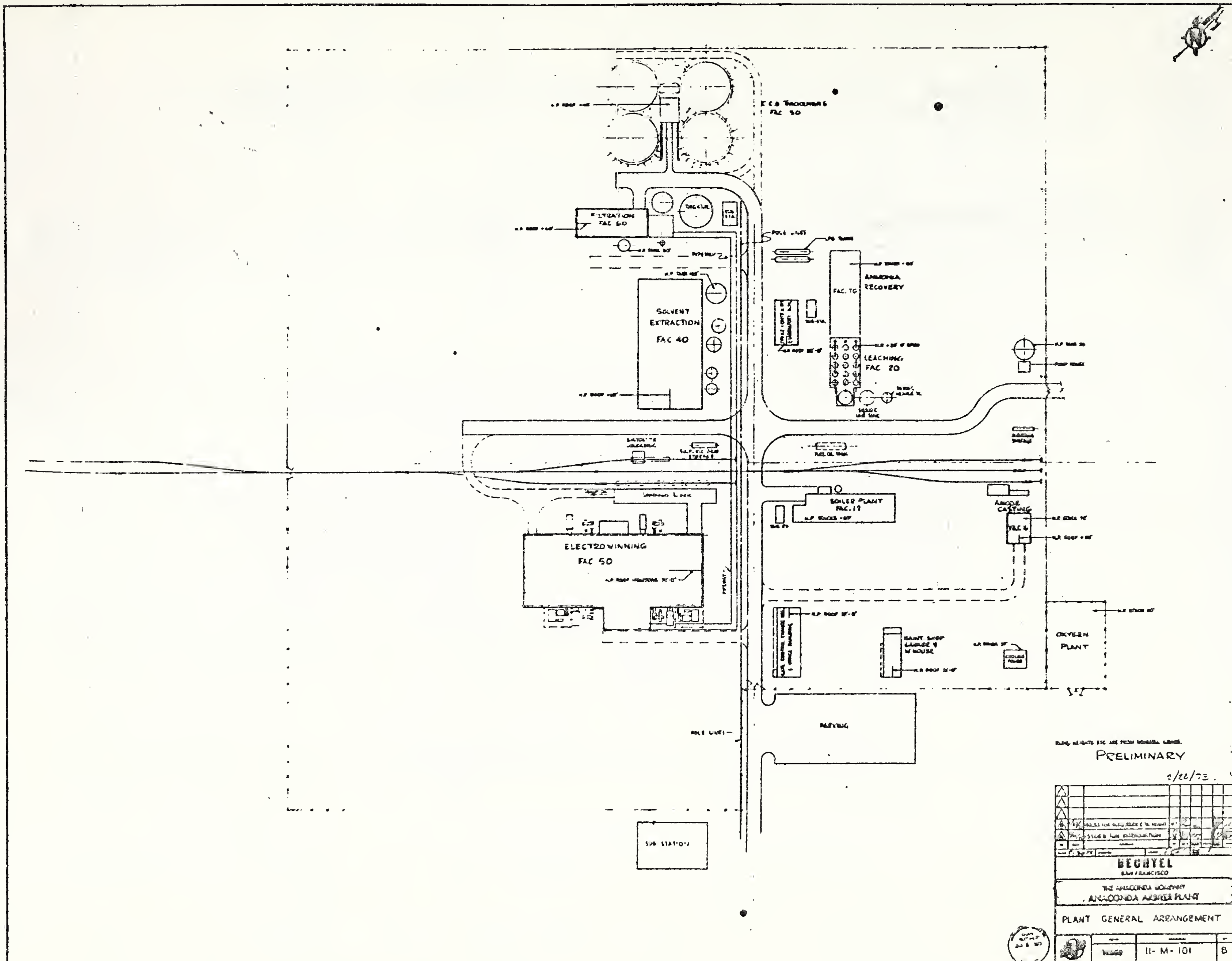

CCD Thickeners FAC 30
Filtration FAC 60
Solvent Extraction FAC 40
Ammonia Recovery
FAC 70
Leaching FAC 20
Electrowinning FAC 50
Boiler Plant FAC 12
Anode Casting
Oxygen Plant
Paint Shop Garage & W House
Parking
Sub Station
Pole Lines
Preliminary
2/22/73
BECHTEL
SAN FRANCISCO
THE ANACONDA COMPANY
ANACONDA ARBITER PLANT
PLANT GENERAL ARRANGEMENT
11-M-101
B

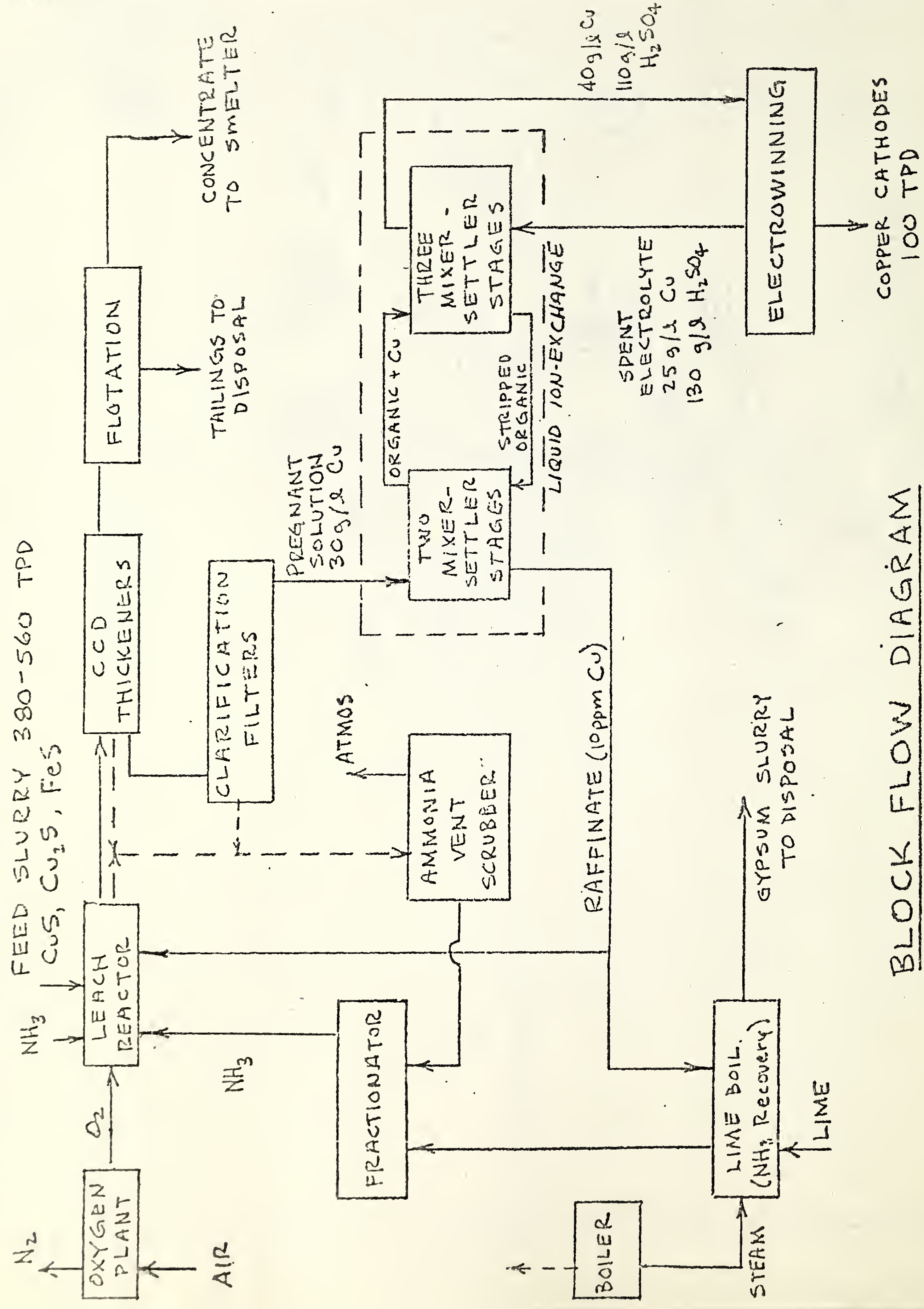
Figure 1

THE ANACONDA COMPANY

ENVIRONMENTAL ENGINEERING DEPARTMENT

DATE 10/12/73 SUBJECT Arbiter Plant PLANT

REMARKS BY FILE

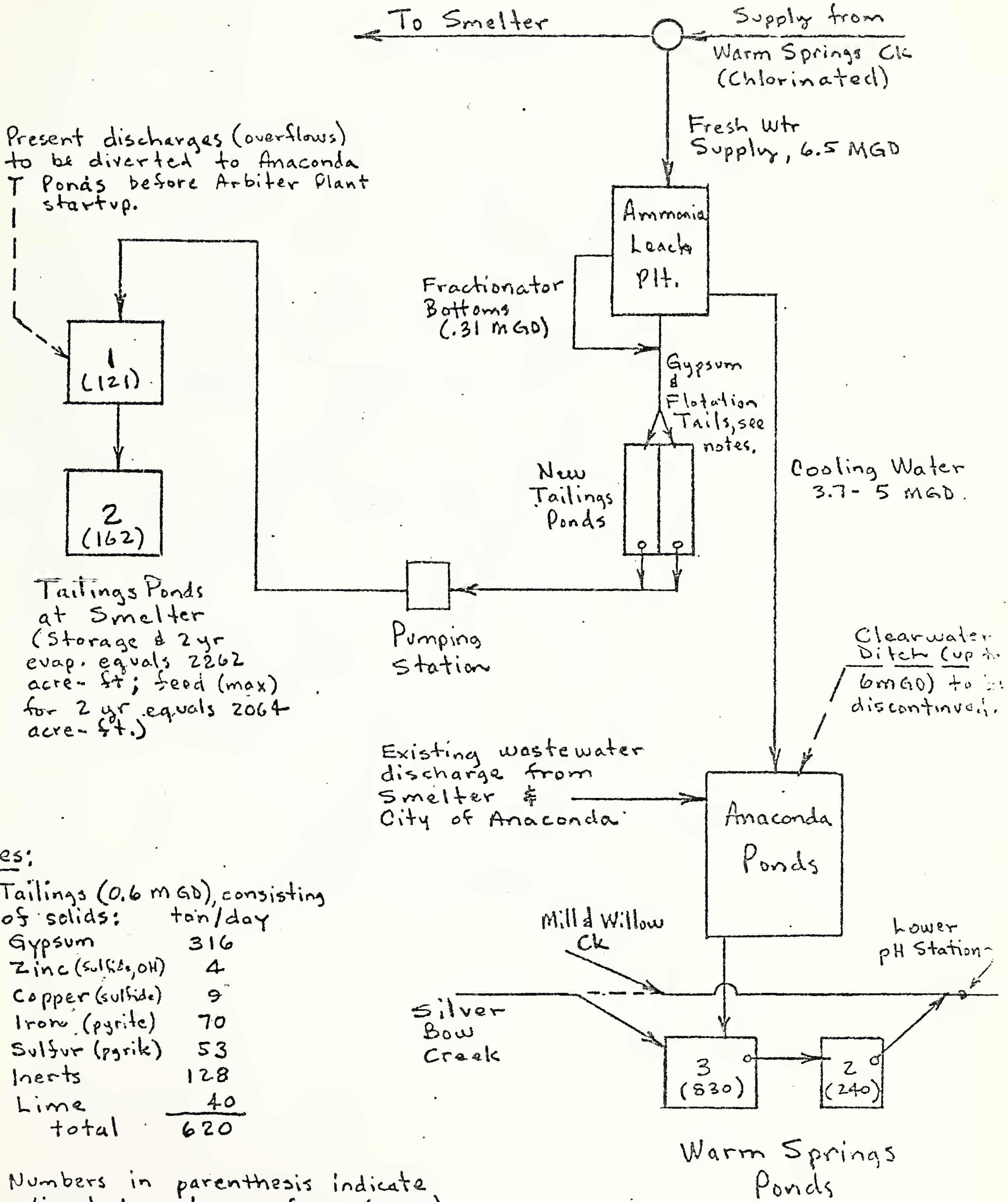



BLOCK FLOW DIAGRAM

FIGURE 2

**THE ANACONDA COMPANY**
**ENVIRONMENTAL ENGINEERING DEPARTMENT**

DATE 10/12/73 SUBJECT Wastewater Disposal PLANT Arbiter, Anaconda
REMARKS BY GMc FILE




Notes:

1) Tailings (0.6 MGD), consisting of solids:

| | ton/day |
|---|---|
| Gypsum | 316 |
| Zinc (sulfide, OH) | 4 |
| Copper (sulfide) | 9 |
| Iron (pyrite) | 70 |
| Sulfur (pyrite) | 53 |
| Inerts | 128 |
| Lime | 40 |
| total | 620 |

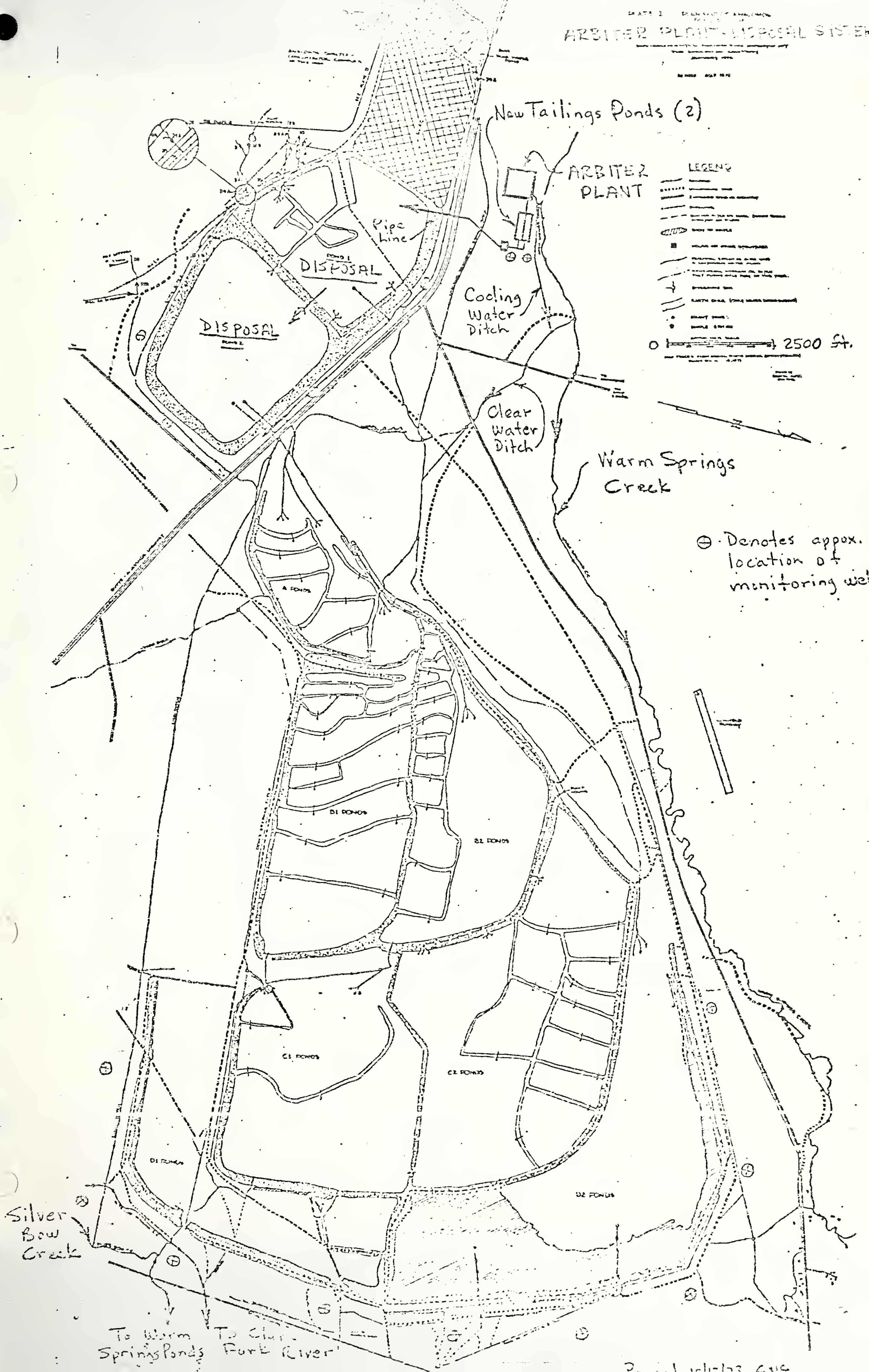
2) Numbers in parenthesis indicate estimated water surface (acres).

3) Monitoring wells not shown.

Schematic Diagram

FIGURE 3

FIGURE 4


ARBITER PLANT-DISPOSAL SYSTEM
New Tailings Ponds (2)
ARBITER PLANT
LEGEND
0 2500 ft.
Pipe Line
DISPOSAL
DISPOSAL
Cooling Water Ditch
Clear Water Ditch
Warm Springs Creek
⊖ Denotes appox. location of monitoring wel
Silver Bow Creek
To Warm Springs Ponds
To Clark Fork River

ANACONDA REDUCTION WORKS, ANACONDA, MONTANA
TABLE A

| A No. | B Description of Emission Point | C Height of Emission Above Ground Level (feet) | D Type of Emissions | E Quantity of Emissions in #/hour | F Type of Control Facility Installed | G Emissions from Control Facility in #/hour | H Efficiency of Control Facility in % | I Emission Allowable (#/hour) | J Cost of Control Facility (millions of dollars) | K When * Installed |
|---|---|---|---|---|---|---|---|---|---|---|
| | HYDROMETALLURGICAL OPERATIONS (ARBITER PLANT) | | | | | | | | | |
| 1. | Ammonia scrubber stack | 120 | $NH_3$ | 900 | Wet scrubber | < 9 | ≯ 99% | ---- | ----* | 10/74 |
| 2. | Electrowinning tank house stacks | 100 | $H_2SO_4$ | <0.75 | Tall stacks (4) | < 0.75 | 0 | —— | ---- | 10/74 |
| 3. | Oxygen plant vent stack | 30 | $N_2$ | 41,700 | Stack (conventional plant) | 41,700 | 0 | ---- | ---- | 10/74 |
| 4. | Cooling tower | 37 | $H_2O$ | 100,000 (200 gpm evaporative and wind loss) | ---- | ---- | 0 | ---- | ---- | 10/74 |
| 5. | Boiler stacks (3 boilers @ 90,000 lbs. steam/hour 2 operational, 1 standby) | 80 | (If operated with natural gas:) | (total 2 boilers) | Tall stack | Same as E | 0 | Reg.90-006 65.4 lbs/hr. particulates total | ---- | 10/74 |
| | | | $CO_2$ | 25,470 | | | | | | |
| | | | $H_2O$ | 19,600 | | | | | | |
| | | | $N_2$ | 135,300 | | | | | | |
| | | | $O_2$ | 5,270 | | | | | | |
| | | | CO | 7 | | | | | | |
| | | | $NO_x$ | 40 | | | | | | |
| | | | $SO_2$ | 0 | | | | | | |
| | | | particulates | 2 | | | | | | |
| | | | (If operated with diesel #2 fuel:) | | | | | | | |
| | | | $CO_2$ | 32,340 | | | | | | |
| | | | $H_2O$ | 14,140 | | | | | | |
| | | | $N_2$ | 135,300 | | | | | | |
| | | | $O_2$ | 5,470 | | | | | | |
| | | | CO | 68 | | | | | | |
| | | | $NO_x$ | 60 | | | | | | |
| | | | $SO_2$ | 6 | | | | | | |
| | *SEE NOTES IN TEXT | | particulates | 6 | | | | | | |

Figure 5

ANACONDA REDUCTION WORKS, ANACONDA, MONTANA

TABLE A

| A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| No. | Description of Emission Point | Height of Emission Above Ground Level (feet) | Type of Emissions | Quantity of Emissions in #/hour | Type of Control Facility Installed | Emissions from Control Facility in #/hour | Efficiency of Control Facility in % | Emission Allowable (#/hour) | Cost of Control Facility (millions of dollars) | When* Installed |
| 6. | Boiler stacks (2 boilers @ 7000 lbs. steam/hour, 1 operational, 1 standby) | 50 | (If operated with natural gas:) | | Tall stack | Same as E. | 0 | Reg.90-006 5.4 #/hr. particulates | ---- * | 10/74 |
| | | | $CO_2$ | 1134 | | | | | | |
| | | | $H_2O$ | 864 | | | | | | |
| | | | $N_2$ | 6030 | | | | | | |
| | | | $O_2$ | 234 | | | | | | |
| | | | CO | 0.3 | | | | | | |
| | | | $NO_x$ | 4 | | | | | | |
| | | | $SO_2$ | 0 | | | | | | |
| | | | particulates | 0.09 | | | | | | |
| | | | (If operated with diesel #2 fuel:) | | | | | | | |
| | | | $CO_2$ | 1440 | | | | | | |
| | | | $H_2O$ | 630 | | | | | | |
| | | | $N_2$ | 6030 | | | | | | |
| | | | $O_2$ | 243 | | | | | | |
| | | | CO | 3.2 | | | | | | |
| | | | $NO_x$ | 6 | | | | | | |
| | | | $SO_2$ | 0.3 | | | | | | |
| | | | particulates | 0.45 | | | | | | |
| 7. | Anode drying,* melting, and casting stack | 75 | particulates | 20.8 | Baghouse | 0.10 | 99.5% | Reg.90-004 6.0 | ---- | 6/74 |

* SEE NOTES IN TEXT

Figu

ANACONDA REDUCTION WORKS, ANACONDA, MONTANA
TABLE A

| A No. | B Description of Emission Point | C Height of Emission Above Ground Level (feet) | D Type of Emissions | E Quantity of Emissions in #/hour | F Type of Control Facility Installed | G Emissions from Control Facility in #/hour | H Efficiency of Control Facility in % | I Emission Allowable (#/hour) | J Cost of Control Facility (millions of dollars) | K When* Installed |
|---|---|---|---|---|---|---|---|---|---|---|
| 8. | Anode drying,* melting, and casting stack | 75 | Combustion products from natural gas<br>$CO_2$<br>$H_2O$<br>$N_2$<br>$O_2$<br>CO<br>$NO_x$<br>$SO_2$<br>particulates | <br><br><br>480<br>370<br>2550<br>99<br>0.14<br>0.76<br>0<br>0.03 | Tall Stack | Same as E. | 0 | ---- | ---- * | 6/74 |
| 9. | Powered roof* exhausts - anode area (2) | 35 | Building air | 2000 acfm each of 2 | Roof exhauster | 2000 acfm each of 2 | 0 | ---- | ---- | 6/74 |
| | | | | | | | | | 2.5 * estimated total emissions control cost | |

* SEE NOTES IN TEXT

Figure 7

ANACONDA REDUCTION WORKS, ANACONDA, MONTANA
TABLE A

| No. | B<br>Description of Emission Point | C<br>Height of Emission Above Ground Level (feet) | D<br>Type of Emissions | E<br>Quantity of Emissions in #/hour | F<br>Type of Control Facility Installed | G<br>Emissions from Control Facility in #/hour | H<br>Efficiency of Control Facility in % | I<br>Emission Allowable (#/hour) | J<br>Cost of Control Facility (millions of dollars) | K<br>When * Installed |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PYROMETTALURGICAL OPERATIONS | | | | | |
| 1. | Main stack | 585 | $SO_2$ | 60,000 (as of 10/74) | Tall stack | 60,000 | 0 | Reg. 90-008 | ---- * | 1914 |
| 2. | Converter roof | 100 | $SO_2$ | 62,000 | Water cooled hoods and new flue | 620 | 99% | Reg. 90-008 | 6.0 * | 6/73 |
| 3. | Acid plant stack | 175 | $SO_2$ | 33,400 | Acid plant and tall stack | 370 | 98.9% * | ---- | 6.6 * | 6/73 |

* SEE NOTES IN TEXT

Figure 8

TROUT UNLIMITED

WEST SLOPE CHAPTER

Aug 27, 1973
715 Beverly
Missoula, Mont.

Don Willems
State Dept. of Health

Don,

Thank you for the opportunity to comment on the Impact Statement for the new Anaconda plant. We hope as much thought has been given to the water pollution potential as has been given to the apparently minimal air pollution potential.

According to the fisheries biologists, the Clark Fork River is now developing into one of the finest fish producing stream in the state (and therefor in the nation). We are most anxious that nothing be done that will endanger this excellent recreational resource.

Our comments are general in nature and we must trust you as the "experts". Page 4 states that 3.7 to 5 mgd of water will be used. We believe that adequate stream flows must be maintained and hopefully you have investigated this.

We believe it is absolutely necessary to prevent any possibility of accidental spills from the settling ponds into the river. It is not sufficient to repremand after a spill because the results

TROUT UNLIMITED

WEST SLOPE CHAPTER

of such a spill can be disastrous. There should be no way for such a spill to occur. Operators can not be trusted as "foolproof" as evidenced by past spills from the Warm Springs ponds. It does no good for the company to apologize or pay a fine after the accident. Safeguards must be built into the treatment system, for unless they are we can surely expect an "accidental" spill which will ruin the recreation of thousands of people.

We note that on pp. 5 the Warm Spring ponds are mentioned as part of the treatment system and on pp 7 it is planned to abandon the ponds, Something is amiss.

We trust you are taking a close look at the operation as planned.

Thank you,

Bill Kendall

President

West Slope Chapter

THOMAS L. JUDGE
GOVERNOR

# STATE OF MONTANA
# DEPARTMENT OF INTERGOVERNMENTAL RELATIONS

MAIL TO CAPITOL STATION, HELENA, MT 59601

| | | | |
|---|---|---|---|
| DIRECTOR'S OFFICE | 406/449-3494 | HIGHWAY SAFETY DIVISION | 406/449-3412 |
| AERONAUTICS DIVISION | 406/449-2506 | INDIAN AFFAIRS | 406/449-2746 |
| CENTRALIZED SERVICES DIVISION | 406/449-3707 | MUNICIPAL AUDIT DIVISION | 406/449-3010 |
| ECONOMIC OPPORTUNITY DIVISION | 406/449-3420 | PLANNING/ECONOMIC DEVELOPMENT DIVISION | 406/449-2400 |


RECEIVED
SEP 5 1973
ENVIRONMENTAL SCIENCES
DIVISION

August 31, 1973

Mr. Daniel Vichorek
Technical Writer
State of Montana
Department of Health and
Environmental Sciences
Helena, Montana 59601

Dear Mr. Vichorek:

The Montana State Clearinghouse has reviewed the draft environmental statement prepared by the Montana State Department of Health and Environmental Sciences, regarding a proposed Hydrometallurgical Operation using the Arbiter Reduction Process, which would be built near Anaconda, Montana. The State Clearinghouse wishes to offer the following comments from the Economic Development Bureau of the Division of Planning and Economic Development:

> "We have reviewed the enclosed draft EIS, which you sent us, regarding the Anaconda Company's new Arbiter Reduction Plant at Anaconda.
>
> "We are pleased that the Company's plans for pollution control will probably result in the plant not only meeting our State's pollution standards but may well result in improved air and water quality within the Anaconda area.
>
> "We wonder, however, if adequate significance has been given to the economic benefits, as listed in Chapter VIII, Page 16, of the EIS? Only the 100 permanent employees have been mentioned, whereas the large number of construction workers that will be employed for

> a considerable period of time will provide a hefty boost to Anaconda's economy. Additionally, the 100 permanent employees will result in secondary employment for a considerable, but indeterminate, number of employees. Finally, the increased employment resulting from requirements for additional mining and milling operations will do much to expand and stabilize the mining industry in the Butte-Anaconda area."

Thank you for the opportunity to review and comment.

Sincerely,

Lloyd F. Meyer

Lloyd F. Meyer, Director
State Clearinghouse

LFM/jw

STATE OF MONTANA

RECEIVED

AUG 2 7 1973

ENVIRONMENTAL SCIENCES DIVISION

DEPARTMENT OF FISH AND GAME

Helena, Montana 59601
August 24, 1973

Mr. Dan Vichorek
Department of Health and Environmental Sciences
Helena, Montana 59601

Dear Dan:

As requested, we have reviewed the environmental impact statement for the proposed hydrometallurgical operation near Anaconda. We have the following comments to make subsequent to that review:

On page 7, the first paragraph indicates overflow water from the tailings pond may be high in nitrogen, and if this is the case, it can be used for irrigation on vegetated areas. The statement does not indicate where these areas are located. If this water is used for irrigation, what assurance is there to prevent spillage and wastewater from contaminating surface waters?

On page 7, the third paragraph states the additional discharge from the new plant will be less than the reduction in discharge from the old plant. There is no data to substantiate this statement.

The legend on Figure 4 and most of the printing on the figure is illegible.

Pages 8 and 9 discusses water quality criteria and classification of the Clark Fork River. The statement says that the classification of the river should be met from the fishery standpoint <u>except</u> possibly during an extended windy period when effluent containing more minerals than desirable may be released. The purpose of the classification and water quality standards is to protect state waters for the uses indicated. If effluents from the settling ponds contain more substances than desirable, then this should be treated as a violation. This part of the treatment system is undesirable and is not mentioned in Section IV -IMPACTS, on page 12.

Page 10, paragraph 5 states the Anaconda Company is designing a well system for monitoring ground water quality and water table changes. I understand ground water quality around the existing Anaconda ponds is not good. What actions will be taken to eliminate further ground water contamination? This also is not mentioned in Section IV.

In closing, we thank you for the opportunity to comment, and would appreciate answers to the few remaining questions we have raised. We are particularly interested in provision for preventing effluents from reaching the Clark Fork River no matter what the weather conditions may be.

Sincerely,

Jim Posewitz

James A. Posewitz, Administrator
Environment and Information Division

JAP/sd

cc: Fletcher Newby



# LAST CHANCE AUDUBON SOCIETY

Office of the President
1821 Grizzly Gulch
Helena, Montana 59601

August 30, 1973

Mr. Daniel Vichorek, Technical Writer
Montana Department of Health and Environmental Sciences
Helena, Montana 59601

Dear Mr. Vichorek:

We have reviewed the draft environmental impact statement on a proposed hydrometallurgical operation which would be built by the Anaconda Company near Anaconda and are pleased with the prospect of improved air quality with this plant.

We notice, however, that there is a chance of decreased water quality as a result of this operation and feel the statement in section IV. IMPACTS should be changed from "... treatment facilities could be required ..." to "... would be required..." Also, although we perhaps did not read carefully enough, we do not understand whether or not this new plant will require an increased consumption of water. Data in figure 3 implies a consumptive loss of 0.5 million gallons per day. Although this is less than a constant cubic foot per second we believe this, or whatever the loss is, should be described under IMPACTS.

We appreciate the opportunity to review the impact statement and express our views.

Sincerely,

Jean E. Smith

JEAN E. SMITH, PhD
President

MONTANA BUREAU OF MINES AND GEOLOGY

BUTTE, MONTANA 59701

OFFICE OF THE DIRECTOR

September 7, 1973



Mr. Daniel Vichorek
Technical Writer
Department of Health and
Environmental Sciences
State Capitol
Helena, MT 59601

Dear Mr. Vichorek:

Thank you for sending a copy of the August 16 draft environmental impact statement relative to the proposed hydro-metallurgical operation near Anaconda.

The statement appears to be adequate and satisfactory insofar as this Bureau is concerned. It would be our opinion that the so-called "Arbiter reduction process" would result in substantial environmental improvements as related to the present reduction system.

Sincerely,

S. L. Groff, Director
and State Geologist

cc Mr. M. R. Miller

SKYLINE SPORTSMEN'S ASSOCIATION, INC.

P. O. BOX 173 BUTTE, MONTANA 59701

September 15, 1973

1973

ENVIRONMENTAL SCIENCES DIVISION

Daniel Vichorek, Technical Writer
Department of Health and Environmental Sciences
Helena, Montana 59601

Dear Mr. Vichorek:

We thank you for submitting the impact statement regarding a proposed hydrometallurgical operation using the Arbiter reduction process to be built near Anaconda.

As none of us pretend to be experts on matters of this kind, we have no comments to make and willingly accept any decision that the Air Quality Bureau makes.

Yours very truly,

SKYLINE SPORTSMEN'S ASSOCIATION

D Roscoe Dickerson

Secretary

IN REPLY REFER TO

# United States Department of the Interior

BUREAU OF LAND MANAGEMENT

STATE OFFICE
316 NORTH 26TH STREET
BILLINGS, MONTANA 59101

921:1792

1973

ENVIRONMENTAL SCIENCES DIVISION
SEP 12 1973

John S. Anderson, M.D.
Director
Department of Health & Environmental Sciences
State of Montana
Helena, Montana 59601

Dear Dr. Anderson:

We have reviewed the draft environmental impact statement on the Anaconda Arbiter Reduction Process and find the statement provides a fund of information on the arbiter process which is very helpful to the reviewer. However, it lacks a section describing the existing environment. The benchmark data in this section could be shown in tabular form indicating the present air quality, electrical and heat energy requirement, water quality, water requirement, volume of input, waste output, etc. Add to this similar data on the new arbiter plant and finally the reviewer will have the data necessary to evaluate the impacts of this proposal.

The impact section on page 12 lacks data on electrical energy, natural gas supplies, water and waste disposal. Information needed:

1. Electrical energy - Is the energy requirement built into the approved Colstrip generating plant?

2. Transmission lines - Are the present energy transmission lines leading from the plant site to the primary Colstrip to Warm Springs line capable of handling the increased load or will new lines be required and where will they be located?

3. Heat energy - As the gas companies are predicting a 15 percent shortage in natural gas and heating oils during the winter period, what will be the social impact on schools, homes, businesses?

4. Water - Where will the 3 to 7 million gallons of water per day come from and what will the impact be on present users?

5. Tailing ponds - The 4200 acre disposal area is now 60 percent filled. How long before the area is filled with tailings and where is the next disposal site?

6. Nitrogen - Page 7 states overflow water is high in nitrogen content. What will be the impact on fisheries habitat and stream eutrophication?

7. The State of Montana operates two hospitals and one penal institution in the valley. What will the impact be on these treatment centers?

We want to thank you for the privilege of reviewing and commenting on the draft statement and we sincerely hope our comments will be useful in strengthening the final impact statement.

Sincerely yours,

Harold C Lynd

Harold C. Lynd
Acting State Director

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
DEERLODGE NATIONAL FOREST

Butte, Montana 59701
September 21, 1973
8420

RECEIVED
SEP 25 1973
ENVIRONMENTAL SCIENCES
DIVISION

Department of Health and Environmental Sciences
Montana State Department of Health & Environmental Sciences
ATTNETION: Mr. John S. Anderson, M.D. - Director
Helena, Montana 59601

Gentlemen:

A review of the proposed Arbiter Process shows it will result in a significant reduction of sulfer dioxide emissions to the atmosphere in the vicinity of the proposed plant, and lessen the impact on the vegetative resources of the area. A substantial benefit will show results in improving the air quality. The report indicates about 300 tons of sulfer dioxide emissions per day will be eliminated from the air. To accomplish this reduction, some minor problems may be encountered resulting from the Arbiter Process which may require some further clarification.

The questions raised in the draft environmental impact statement prepared by the Environmental Sciences Division are primarily concerned with the disposal and in retention of some gaseous, liquified ~~solid~~ waste materials that will result from the Arbiter Process. The basic problem posed is the end effect and impact on animal and plant life of noxious and toxic substances of low percentage or quality which were allowed to accumulate into large volumes or tonnages through processing large tonnages of sulfide concentrates over a long period of time.

The report shows provisions will be made to recover most gases (ammonia, and ammonium and inert gases) from the leach-reactors, counter current decantation thickeners, etc., but there will be some loss of gases to the atmosphere. Provisions will be made to exhaust these gases from the plant. It is expected control of these gases, not recovered, will bely dispersion and dissipation into the atmosphere. This is expected to lower the volume and percent of these gases emitted in the air to acceptable limits and meet State of Montana standards.

The problems raised are:

1. What happens in the event dissipation and dispersion does not occur as expected and a temperature inversion condition or other adverse weather conditions result in stagnation and poor ventilation. This situation does occur in the Anaconda valley during winter months.

2. What impact will accumulation of the gases have on animal and plant life in the area over a long period of time.

3. Will the air standards now considered acceptable be acceptable in the future as more data becomes available on toxic effects of the gases or waste products.

In the course of effecting a reduction in the sulfur-dioxide content of the air, some of the sulfur will be discharged as calcium sulfate or gypsum in the tailings, at the rate of 319 tons per day. This presents some solid waste disposal problems.

A substantial amount of the calcium sulfate will eventually be discharged to Silver Bow Creek. The stated amount is 8,000 pounds of calcium and 10,000 pounds of sulfate per day.

Calcium sulfate is fairly insoluable, but this may not be the case under conditions not existing in the pond. Some dissolvation may occur with changes in PH conditions releasing sulfate to the downstream waters. The total waste solids to ponding will be about 620 tons/day. Excluding the 316 tons of gypsum, there will be 7 tons/day of zinc (sulfides and hydroxides), 9 tons/day coper (sulfides), 70 tons/day iron (pyrite) 70 tons/day sulfur (as pyrite), 53 tons/day inerts (anions and quartz) and 120 tons/day of lime (calcium hydroxide).

The metallic sulfides of iron, copper and zinc, oxidize, hydralize and react chemically to form more soluable compounds which are mobile and may be retained in solution. This suggests two problems:

√ 1. Can the discharge of these toxic materials from the tailings pond to Silver Bow Creek be kept within acceptable limits.

2. What can be expected through leakage of the pond waters charged with these soluable materials to the sub-surface waters in the area.

The Arbiter Process calls for a floatation stage following the CCD filters to recover copper and other sulfides not solubilized in the leach reactors. The floatation process employs substantial quantities of reagents (zonthates, frother, and lime) to effect recovery of the copper.

These reagents are present in small excess over actual requirements and a fraction of the excess will eventually be discharged with the floatation tailings. The hydrocarbon reagents are noxious, highly toxic and remain in solution. They are not readily decomposed nor is there presently any commercial process to clarify waters of these substances, other than prolonged biological processes or oxidation through aeration. The problem presented in what effect these reagents will have on animal and plant life downstream from the tailings pond complex if the reagents are not removed or completely decomposed prior to discharge. The report is silent in this respect.

Two aspects not discussed in the report:

1. How dust control of the ponds will be provided if the water requirements are reduced and less water is available to keep the ponds wet down during the periods of high wind.

2. What further use and recovery may be made of the large amounts of ammonium and nitrogenous material discharged to the ponds rather than impound and discharge to Silver Bow Creek. Could some use be made of this material as fertilizer, etc., which is much needed in the area, and to assist in vegetation growth for beautification of the plant area.

In summary, it appears the Arbiter Process will have a highly beneficial effect in substantially reducing the sulfur dioxide content now emitted to the air in the present smelter operations. This should improve the present impact of sulfur emissions on both animal and vegetative resources in the area.

The side problems arising out of the Arbiter Process do not appear to present unsurmountable objections and appear correctable and controllable if given proper consideration. The benefits to be derived far outweigh the side problems.

Sincerely,

Keith M. Thompson

KEITH M. THOMPSON
Environmental Coordinator

STATE OF MONTANA

# Environmental Quality Council

FLETCHER NEWBY
EXECUTIVE DIRECTOR

CAPITOL STATION, HELENA, MT. 59601



October 1, 1973

RECEIVED
... 1973
ENVIRONMENTAL SCIENCES
DIVISION

Mr. Dan Vichorek
Air Quality Bureau
Dept. Health & Environmental Sciences
Cogswell Building
Helena, Montana 59601

Dear Dan:

Per your request, we have reviewed the environmental impact statement for the proposed Arbiter Plant at Anaconda and submit the following comments:

<u>Page 1</u>

✓ How much water will be required to transport the concentrates (feed slurry) from the unloading point to the leach system? Will this water be recycled? Is it in excess of water used for cooling and tailings slurry?

<u>Page 3</u>

✓ The spent electrolite is bled from the system to where? Reference figure 2.

✓ What will be the effectiveness of the pond system in reducing the discharge of contaminants to Warm Springs Creek and what will be the retention time in the ponds with an increased load and a reduced capacity (60% full)? The slurry entering the pond system contains 0.2 g.p.l. of free ammonia. Since it is not likely that there will be an abundance of organisms in the system that will reduce the ammonia content of the effluent and since the ammonia losses to the atmosphere will likely be the only significant loss, the effectiveness of the pond system in reducing ammonia is open to question. What will be the net reduction in ammonia through the pond system? Because this is a new point source of discharge and because of state and federal nondegradation policies, the additional discharge of nitrogenous material (and other materials) to Warm Springs Creek from the Arbiter process should be kept at zero. This should be discussed in the section on Impacts (section IV).

✓ What is the remaining life of the existing pond system? Is it greater or less than the life of the Arbiter Plant?

The total amount of nitrogen and free ammonia (pounds or tons per day) should also be reflected in the material breakdown of the slurry discharged to the pond system, listed at the top of page 7, for comparison with figures given below for material discharge from the pond system.

Page 4

How does this new facility justify the use of natural gas or fuel oil in lieu of eastern Montana coal, in view of the current national policy to conserve these fuels and to use low sulfur coal for firing boilers? This should be covered in section VII on Irreversible Commitment of Resources.

In addition to the 5 million c.f.d. of natural gas used to fire the boilers, how much gas is also used in the anode casting area?

There should be more information included on the anode casting area. What operations will be performed in the area? What generates the requirement for a bag house (table A, item 7) and a 75 ft. stack? Why the powered roof in "Area 2"? What will be the temperature of the lead during processing (how "low" to "avoid lead fume")? Why is the bag house currently under construction when we understand that a permit has not been issued, as required by law?

How much "fresh water" will be used for ammonia recovery? Is it in excess of the water used for cooling and tailings slurry?

Page 7

Anaconda's water conservation program should be explained in greater detail, as it is not obvious to the reader just how there will be a net decrease in water consumption at Anaconda and correspondingly a net decrease in discharge to the Clark Fork River. It is noted, however, that the Arbiter plant will consume about 60% as much water as Colstrip generating plants 1 and 2, and that serious drawdown of Silver Lake and Georgetown Lake may be a consideration. Also, the effect of reduced flow to the Clark Fork as a result of a water conservation plan at Anaconda should also be investigated.

If the overflow from the pond is used for irrigation of vegetated areas, where are these areas located? How would these waters be prevented from mixing with surface waters? What would be the effect of heavy metals on the irrigated areas?

Since it is not known when the heavy metal concentration of Silver Bow Creek will return to an acceptable level, and hence, when it will be possible to abandon the Warm Springs pond system, all reference to the near future should be deleted with respect to this subject. It may not happen within the life of the Arbiter Plant.

Pages 8 and 9

If the stream classification of the Clark Fork River is violated on windy days, some corrective action should be taken. This subject should be covered in the section on Impacts (section IV).

What plan does the State of Montana have for monitoring the quality of the discharge from Warm Springs Ponds or Silver Bow Creek? This should be covered in the impact statement.

The drinking water standard for sulfides on the Clark Fork River must be maintained regardless of the fact that "there is presently no public drinking water supply" on this river. A supply may be required in the future. This should be covered in section IV on Impacts.

Page 10

What chemical or physical parameters are going to be assessed in the fish bioassay? Will this be accomplished in accordance with Standard Methods, or some other such recognized procedure? If so, it should be cited.

Will the state also gather test data from the test wells to be drilled in the vicinity of the tailings pond area? What will be the disposition of the test data? What action will be taken, and by whom, if the test results indicate a negative impact on ground water quality or water table level. The feasibility of discharging the Arbiter Plant to a sealed impoundment should be studied.

Pages 12 and 13

We understand that the Arbiter Plant is a plant expansion and will handle concentrate from both Butte and Victoria. Moreover, it is now planned to start up the old concentrator at Anaconda to handle increased production. It is also planned to operate both the pyro plant and Arbiter Plant at capacity, hence there may be no significant reduction in the current level of $SO_2$ discharged to the atmosphere at the pyro plant. It is understood, however, that lower grades of concentrate with high sulfur content (about 35%) will be processed at the Arbiter Plant, but that this will not exceed 560 tons/day. Therefore, at best, the Arbiter Plant will probably enable increased production without further degradation to air quality in the Anaconda area. It is suggested that all reference to a reduction of $SO_2$ emission by 300 tons/day be deleted from the impact statement.

There has not been sufficient evidence presented to conclude that a water treatment facility is not warranted at this time. It is recommended that item #1, page 13, be deleted. The last sentence of the FORWARD should also be deleted.

Page 16

Per Mr. Arbiter, there are two alternatives for disposing of sulfur in addition to the lime-boil method currently planned for the plant in Anaconda. One process converts the waste product to ammonia and elemental sulfur. Plants in Europe are presently being designed for this method and the Anaconda Company is currently studying the economics of employing this method in this country.

The other method is to crystalize out ammonium sulfate. This method would require less steam and no lime. There would be less investment, less energy required, and no waste disposal problem for nitrogenous material. Mr. Arbiter said that this is the most preferred of the three alternatives but that it was not being used at Anaconda because there was no market for ammonium sulfate in the area. Obviously, this method would conserve natural gas (or oil) and water, and would eliminate the possible necessity for a

costly water treatment facility to treat the effluent before discharging it to Warm Springs Creek. Section VIII should be expanded to include a ✓discussion of these alternatives and their economic benefits. Also, what will be the source and quantity of lime used in the proposed process? This should be discussed in section VII.

General Comments

1. What impact will the discharge from the Arbiter Plant have on existing or future tailing pond reclamation efforts? This should be discussed in the section on Impacts (section IV).

✓ 2. Particulate emission data (for the pyro plant) should also be included in figure 8.

3. This office anticipates that the potential for serious water pollution will be investigated at greater depth by the Water Quality Bureau and that a revised impact statement will be issued prior to issuing a discharge permit for the Arbiter Plant.

Sincerely yours,

Walter I. Enderlin
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Environmental Engineer

Loren L. Bahls
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cc: D. Willems
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